

# Impulsive Personality and Alcohol Use: Bidirectional Relations Over One Year

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**ABSTRACT. Objective:** Impulsive personality traits have been found to be robust predictors of substance use and problems in both cross-sectional and longitudinal research. Studies examining the relations of substance use and impulsive personality over time indicate a bidirectional relation, where substance use is also predictive of increases in later impulsive personality. The present study sought to build on these findings by examining the bidirectional relations among the different impulsive personality traits assessed by the UPPS-P Impulsive Behavior Scale, with an interest in urgency (the tendency to act rashly when experiencing strong affect). **Method:** Participants were 525 first-year college students (48.0% male, 81.1% White), who completed self-report measures assessing personality traits and a structured interview assessing past and

current substance use. Data collection took place at two different time points: the first occurred during the participants' first year of college, and the second occurred approximately 1 year later. Bidirectional relations were examined using structural equation modeling. **Results:** Time 1 (T1) positive urgency predicted higher levels of alcohol use at Time 2 (T2), whereas T1 lack of perseverance predicted lower levels of alcohol use at T2. T1 alcohol use predicted higher levels of positive urgency, negative urgency, sensation seeking, and lack of premeditation at T2. **Conclusions:** Findings provide greater resolution in characterizing the bidirectional relation between impulsive personality traits and substance use. (*J. Stud. Alcohol Drugs*, 77, 473–482, 2016)

IMPULSIVITY, THE TENDENCY TO ACT without adequate forethought or the propensity to engage in risky behaviors, has been found to relate to a number of negative outcomes and mental health difficulties, including risky sexual behavior (Deckman & DeWall, 2011; Zapolski et al., 2009), eating disorders (Fischer & Smith, 2008; Fischer et al., 2008), aggression and antisocial behavior (Lynam & Miller, 2004; Miller & Lynam, 2001), and personality disorders (Jacob et al., 2010; Whiteside et al., 2005). A large body of research has demonstrated the relevance of impulsive personality to substance use risk, because impulsive traits have been shown to relate to substance use/problems both concurrently and prospectively (Ball et al., 1994; Carlson et al., 2010; Corbin et al., 2011; Fischer & Smith, 2008; Grau & Ortet, 1999; Horvath et al., 2004; Lynam & Miller, 2004; Magid et al., 2007; Milich et al., 2000; Miller et al., 2003; Puente et al., 2008; Schepis et al., 2008; Sher et al., 2000; Verdejo-García et al., 2007). Further support for impulsivity's contribution to the development of problematic substance use comes from studies of individuals identified as at risk for substance dependence based on family history, who have been found to be more impulsive on a variety of measures (Acheson et al., 2011; Handley et al., 2011; Tarter

et al., 2003). Together these findings provide strong support for impulsivity's role as a risk factor for the development of problematic substance use.

In addition to increasing risk, impulsive personality has been found to be affected by substance use behavior. In a longitudinal study in which participants were assessed during 9th or 10th grade and then again at age 19 or 20, sensation seeking (an impulsivity-related trait) and substance use were found to mutually influence one another, with sensation seeking predicting later substance use and substance use predicting later sensation seeking (Horvath et al., 2004). A longitudinal study beginning in high school and following individuals through their senior year of college found similar results, with impulsivity and sensation seeking predicting subsequent heavy drinking and heavy drinking predicting changes in both impulsive traits (Quinn et al., 2011). The impact of substance use on impulsivity in both studies suggests that, just as life experiences regarding relationships (Helson & Moane, 1987; Neyer & Asendorpf, 2001; Roberts et al., 2002) and occupation (Helson & Moane, 1987; Helson & Picano, 1990; Roberts et al., 2003) affect personality, so too can experiences with substance use. In addition, these findings are consistent with the Correspondence Principle, which indicates that "the most likely effect of life experience on personality development is to deepen the characteristics that lead people to those experiences in the first place" (Caspi et al., 2005; p. 470). In this case, impulsivity predisposes an individual to substance use and is in turn influenced by substance use behavior.

Rather than viewing impulsivity as a single trait, a number of theories (Buss & Plomin, 1975; Dickman, 1990;

Received: January 22, 2015. Revision: September 28, 2015.

This study was supported by National Institute on Drug Abuse Grant DA005312.

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Eysenck & Eysenck, 1985; Patton et al., 1995; Whiteside & Lynam, 2001; Zuckerman, 1994) have suggested that impulsive personality is better understood as being made up of two or more distinct traits. The UPPS-P Impulsive Behavior Scale (Lynam et al., 2006; Whiteside & Lynam, 2001) was constructed through factor analysis of several measures of impulsive personality and assesses five distinct facets of impulsivity. The UPPS-P model includes the following traits: sensation seeking (the tendency to seek out novel or exciting experiences and a willingness to take risks to do so), lack of premeditation (the tendency to act without adequate consideration of potential consequences, similar to prototypical definitions of impulsivity), lack of perseverance (the inability to sustain attention on boring or difficult tasks), negative urgency (the tendency to act rashly when experiencing strong negative affect), and positive urgency (the tendency to act rashly when experiencing positive affect).

Supporting the utility of a multidimensional view of impulsivity, these traits have been found to differ in their relations with outcomes of interest. For example, of the five traits, lack of premeditation appears to be the most relevant to crime and antisocial behavior (Lynam & Miller, 2004; Miller et al., 2003), whereas negative urgency appears to be particularly relevant to eating disorder symptomatology (Fischer et al., 2008). Furthermore, the relations of the UPPS-P facets with different types of substance-related outcomes vary, providing support for the utility of a multidimensional perspective. Sensation seeking, for example, appears to be particularly important in predicting frequency/amount of use, whereas positive urgency and negative urgency are better predictors of alcohol-related problems (Curcio & George, 2011; Fischer & Smith, 2008; LaBrie et al., 2014; Stojek & Fischer, 2013).

These differences among the UPPS-P impulsive traits in their associations with outcomes of interest indicate that, in considering personality risk for substance use and problems, the specific impulsive trait under consideration matters. The same may be true when considering the influence of substance use on impulsive personality. Although research indicates that substance use can influence sensation seeking (Horvath et al., 2004; Quinn et al., 2011) and prototypical impulsivity (Quinn et al., 2011), no known research has examined the impact of substance use on all of the UPPS-P impulsive traits. Based on its robust relations with substance use and problems (Cyders et al., 2007; Cyders et al., 2009; Fischer & Smith, 2008; Fischer et al., 2004; Kaiser et al., 2012; Magid & Colder, 2007; Miller et al., 2003; Settles et al., 2012; Verdejo-García et al., 2007, 2010), it seems essential to consider how urgency is influenced by substance use.

Urgency's affective component distinguishes it from other impulsive traits and may make negative urgency and positive urgency particularly important to consider when examining the causes and consequences of substance use. Because urgency is defined as impulsive action occurring under con-

ditions of strong affect, positive and negative reinforcement seem likely to contribute to its relation to alcohol use and subsequent changes in impulsive personality. For individuals high in urgency, engaging in heavy drinking while experiencing strong affect may serve to increase positive emotions or reduce negative ones, increasing the likelihood that they will engage in alcohol use or other impulsive behavior when experiencing strong affect in the future and thus behave in ways consistent with higher trait urgency.

The current study sought to clarify our understanding of the bidirectional relations between impulsivity and substance use by examining the relations between the UPPS-P impulsive traits and alcohol use. A two-wave design was used, with assessments spaced approximately 1 year apart. Assessment of personality and of current alcohol use occurred at both waves, allowing for investigation of the incremental impact of impulsive personality on later alcohol use and the impact of alcohol use on later personality. Heavy substance use during young adulthood (Hasin et al., 2007), and among college students specifically (Ford, 2007; Knight et al., 2002), and lower personality stability during this period (Hopwood et al., 2011) suggest that a college student sample may be ideal for answering questions about the impact of substance use on personality.

The first research question is how impulsive personality contributes to alcohol use 1 year later, when initial levels of alcohol use are controlled for. Based on previous findings, we hypothesized that sensation seeking, lack of premeditation, positive urgency, and negative urgency would all predict later alcohol use. The second research question is how alcohol use will affect impulsive personality 1 year later, when initial personality is controlled for. It was hypothesized that findings would be consistent with the Correspondence Principle and that the same impulsive traits that predict alcohol use—sensation seeking, lack of premeditation, positive urgency, and negative urgency—would also be influenced by alcohol use.

## Method

### Participants

Participants at Time 1 (T1) were 525 college students (48.0% male;  $M_{\text{age}} = 18.95$  years,  $SD = 0.77$ ) from a public university in the southern United States. The ethnic distribution of the sample was as follows: 81.1% White, 12.4% African American, 2.5% Asian, 1.5% Hispanic/Latino, 1.9% biracial, 0.2% American Indian/Alaska Native, 0.2% Native Hawaiian/Pacific Islander, and 0.2% other. Participants were recruited in two cohorts, 1 year apart, from the undergraduate research pool. "High-risk" subjects were invited to participate in the study by email to ensure sufficient variability in substance use; they made up 23.1% of the sample (see the *Screening procedure* section for more information).

Previous research has found disruptive behavior in childhood and adolescence to be associated with later substance use disorders (e.g., Harford & Muthén, 2000; Kuperman et al., 2001); therefore, delinquent behavior during adolescence was assessed to identify high-risk participants. Although these high-risk subjects were specifically invited to participate, any first-year student enrolled in introductory psychology was eligible. Students enrolled in introductory psychology who were not in their first year were not eligible for study participation. To enroll, students signed up using an online recruitment system. As a part of their introductory psychology course, students took part in various psychological research studies and were provided with information on how to access the online recruitment system. This recruitment system displayed studies that were open for participation, and students could choose which studies to sign up for. Of the 525 individuals who participated at T1, 459 participated again at Time 2 (T2; 87%). Procedures for handling missing data are discussed in *Data analyses* in the Method section. The project has been approved by the institutional review board of the University of Kentucky.

### Measures

**UPPS-P.** The UPPS-P (Lynam et al., 2006; Whiteside & Lynam, 2001) is a 59-item self-report inventory designed to measure negative urgency, (lack of) premeditation, (lack of) perseverance, sensation seeking, and positive urgency. Reliability for the impulsive traits in the sample was good, with alphas ranging from .821 (lack of perseverance at T1) to .937 (positive urgency at T2).

**Life history calendar.** The participants' alcohol use was assessed using selected items from the life history calendar (LHC; Caspi et al., 1996). This measure has been validated and proven reliable as a method for obtaining retrospective data; as such, it is commonly used in studies to evaluate health-risk behaviors among adolescents. Tests of reliability and validity for this measure have demonstrated good agreement between the measure and other reports of substance use, with average  $\kappa$ s of .46 to .56 and average correlations of .53 to .64 (Miller et al., 2003). In the current study, participants filled out a computerized version of the LHC with the assistance of a trained experimenter, reporting on 4-month periods dating back to fall of seventh grade during the first wave of data collection and 1-month periods dating back to the month of participants' first collection during the second wave of data collection. For each period, data were collected regarding use, frequency, average amount, and highest amount for tobacco, alcohol, marijuana, cocaine, inhalants, amphetamines, lysergic acid diethylamide (LSD), Ecstasy (3,4-methylenedioxymethamphetamine; MDMA), and club drugs.

Of interest for the current study was the reported average weekly alcohol use at T1 and T2. The calendar year was di-

vided into four different 3-month periods (i.e., August–October, November–January, and so on), and the average weekly alcohol use for T1 was calculated for the 3-month period in which an individual participated in the first wave of data collection. Average weekly alcohol use for T2 was calculated for the same 3-month period in the second wave. Average weekly alcohol use was estimated using the LHC items, “Which of the following best describes how frequently you used alcohol during each of the months you drank?” and “Which of the following describes, on average, how much alcohol you used during the months that you drank?” The frequency and average episodic amount were multiplied to create one variable—average weekly alcohol use—which was an estimate of the number of drinks participants consumed on average in a week.

### Screening procedure

Students in introductory psychology courses were administered a screening questionnaire during the first 2 weeks of the semester. The screening measure consisted of 3 demographic items and 19 items on which participants were asked to indicate their agreement using a dichotomous rating form (“yes” or “no”). Twelve items assessed antisocial or delinquent behaviors, such as skipping school and participating in physical fights. Seven of the items assessed positive or neutral behaviors, such as volunteering and babysitting. A composite score based on responses to the 12 delinquent items was used to determine predicted substance use risk, and the males and females whose scores were above the 75th percentile for their gender were deemed “high risk” and invited to participate through email. These individuals made up 23.1% of the sample; thus, the sampling procedure resulted in a proportion of high risk in the sample that was similar to that of first-year introductory psychology students as a whole.

### Procedure

The first data collection session took place during the participants' first year of college during either the fall or spring semester, and the follow-up session occurred approximately 1 year later. At each time point, participants completed a 2.5-hour data collection session individually, conducted by a trained research assistant. Before beginning, participants read and signed consent forms, asked questions, and completed a saliva drug screen and field sobriety test to ensure that they were not under the influence of any substances. If the participant tested positive for any drugs, he or she was asked to reschedule. Next, participants completed a series of alternating questionnaires and behavioral tasks, and a structured computer-guided interview assessing substance use. Participants took a 5-minute break halfway through the session. Participants were debriefed at the end of the session

TABLE 1. Correlations, means, and standard deviations at Time 1 (T1) and Time 2 (T2)

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	<i>M</i>	<i>SD</i>
1. T1 neg.	—												2.26	0.56
2. T1 prem.	.392**	—											2.03	0.46
3. T1 pers.	.338**	.419**	—										1.85	0.43
4. T1 sen.	.044	.346**	.043	—									3.05	0.52
5. T1 pos.	.725**	.463**	.353**	.213**	—								1.89	0.58
6. T1 alc.	.184**	.342**	.100*	.279**	.290**	—							6.96	7.70
7. T2 neg.	.747**	.358**	.315**	.165**	.589**	.262**	—						2.29	0.50
8. T2 prem.	.368**	.750**	.377**	.302**	.438**	.375**	.483**	—					2.07	0.41
9. T2 pers.	.329**	.312**	.699**	.048	.311**	.121*	.432**	.501**	—				1.93	0.42
10. T2 sen.	-.015	.313**	.002	.834**	.154**	.288**	.128**	.276**	-.078	—			3.06	0.52
11. T2 pos.	.605**	.401**	.315**	.226**	.699**	.276**	.737**	.531**	.405**	.230**	—		1.94	0.53
12. T2 alc.	.183**	.274**	.039	.253**	.308**	.726**	.256**	.271**	.015	.307**	.286**	—	7.36	7.68

Notes: Neg. = negative urgency; prem. = lack of premeditation; pers. = lack of perseverance; sen. = sensation seeking; pos. = positive urgency; alc. = average weekly alcohol use. Average weekly alcohol use has not been square-root transformed.

\* $p < .05$ ; \*\* $p < .01$ .

regarding the purposes of the study. At the first wave of data collection, participants were compensated with course credit for their psychology class and \$30. At the second wave of data collection, participants were compensated with \$50. The current study is part of a larger project, and additional questionnaires and tasks were administered that are not relevant to the current research questions. They are not listed here but are available on request.

### Data analyses

The research questions were examined using longitudinal structural equation modeling in AMOS 22. Each variable of interest was regarded as the sole observable indicator of an underlying construct. Because excluding participants with incomplete data could bias results, the expectation maximization method was used to estimate missing values. A total of 77 participants denied alcohol use at both time points. These individuals were excluded from analyses because of concerns regarding zero inflation. The model included six variables at each of the two time points: lack of premeditation, lack of perseverance, sensation seeking, negative urgency, positive urgency, and average weekly alcohol use. Average weekly alcohol use was square-root transformed to make its distribution of scores more normal. Pathways were specified from each variable at T1 to the same variable at T2 because consistency in these scores was expected. Pathways were also specified from each of the five T1 impulsive personality traits to T2 average weekly alcohol use, and from T1 average weekly alcohol use to each of the T2 impulsive personality traits. The six T1 variables were allowed to covary as were the error terms among the T2 variables.

To address the research questions, the statistical significance of the specified pathways (i.e., from T1 personality traits to T2 alcohol use, and from T1 alcohol use to T2 personality traits) was examined. Because the impulsive personality traits (or their errors) were allowed to correlate within the same time point and paths were specified linking

each T1 personality trait to the same at T2, results accounted for the relations among the impulsive personality traits and for their consistency across time. Overall model fit was assessed using four indices: the comparative fit index (CFI), the normative fit index (NFI), the root mean square error of approximation (RMSEA), and the relative chi-square (CMIN/*df*). CFI and NFI values above .95 represent a very good fit (Hu & Bentler, 1999), whereas RMSEA values of .08 or lower indicate acceptable fit (Little, 2013). CMIN/*df* values below 3 are considered to be adequate fit (Kline, 1998).

The main model of interest was compared to an alternative model, where pathways from T1 alcohol use to T2 personality were not included. The purpose of this alternative model was to test whether the original bidirectional model was a better fit for the data than a unidirectional model (i.e., personality predicting alcohol use).

## Results

### Preliminary analyses

Binary logistic regression was used to examine whether individuals who returned for T2 participation differed from those who did not. Three categorical variables (gender, White race, and high-risk status) and six continuous variables (average weekly alcohol use, negative urgency, positive urgency, lack of premeditation, lack of perseverance, and sensation seeking) were entered as predictors of attrition. None of the tested variables was a significant predictor of attrition. The correlations among the variables were examined at T1 and T2 to determine how they relate to one another cross-sectionally. Correlations, means, and standard deviations are listed in Table 1. Although alcohol use was square-root transformed before testing the longitudinal model, the nontransformed variable was used for the correlations and descriptive statistics. Negative urgency and positive urgency were highly correlated (.725 at T1 and .737 at T2). For the most part, the UPPS-P variables were significantly correlated with each



TABLE 2. Standardized effects of Time 1 (T1) personality on Time 2 (T2) alcohol use and T1 alcohol use on T2 personality

Variable	Standardized effect	<i>p</i>
T1 personality predicting T2 alcohol use		
Negative urgency → alcohol use	.024	.593
Positive urgency → alcohol use	.113	.016
Lack of premeditation → alcohol use	.003	.942
Lack of perseverance → alcohol use	-.073	.034
Sensation seeking → alcohol use	.043	.209
T1 alcohol use predicting T2 personality		
Alcohol use → negative urgency	.162	<.001
Alcohol use → positive urgency	.101	.005
Alcohol use → lack of premeditation	.142	<.001
Alcohol use → lack of perseverance	.065	.070
Alcohol use → sensation seeking	.073	.007
Stability coefficients from T1 to T2		
Negative urgency	.671	<.001
Positive urgency	.635	<.001
Lack of premeditation	.681	<.001
Lack of perseverance	.649	<.001
Sensation seeking	.811	<.001
Alcohol use	.708	<.001

other within time points; the exceptions were T1 sensation seeking and negative urgency, and sensation seeking and lack of perseverance at both T1 and T2, respectively. All of the UPPS-P variables were significantly correlated with average weekly alcohol use at T1, and all of the UPPS-P variables except for lack of perseverance were significantly correlated with average weekly alcohol use at T2.

#### *Results of the structural equation model*

Standardized effects of the T1 variables on the T2 variables are listed in Table 2, and Figure 1 shows the final model with beta values for the significant pathways. Each of the variables at T1 was a significant predictor of the same variable at T2. T1 positive urgency predicted higher levels of alcohol use at T2 (estimated  $\beta = .113$ ,  $p = .016$ ), whereas T1 lack of perseverance predicted lower levels of alcohol use at T2 (estimated  $\beta = -.073$ ,  $p = .034$ ). T1 average weekly alcohol use predicted four T2 personality variables: negative urgency (estimated  $\beta = .162$ ,  $p < .001$ ), positive urgency (estimated  $\beta = .101$ ,  $p = .005$ ), sensation seeking (estimated  $\beta = .073$ ,  $p = .007$ ), and lack of premeditation (estimated  $\beta = .142$ ,  $p < .001$ ). Overall model fit was good across the following indices: CMIN/ $df = 2.900$ ; CFI = .985; NFI = .977; and RMSEA = .065. Squared multiple correlations for each of the T2 variables were as follows: negative urgency ( $R^2 = .514$ ), positive urgency ( $R^2 = .448$ ), premeditation ( $R^2 = .551$ ), perseverance ( $R^2 = .435$ ), sensation seeking ( $R^2 = .697$ ), and average weekly alcohol use ( $R^2 = .578$ ).

#### *Comparison to alternative model*

An alternative model was tested with pathways specified from T1 personality to T2 alcohol use, but not from T1 alco-

hol use to T2 personality. Fit indices were as follows: CMIN/ $df = 3.624$ ; CFI = .975; NFI = .966; and RMSEA = .077. To test whether the alternative model was significantly different from the original model, we examined the differences in the chi-square values and degrees of freedom between the models. For the original, bidirectional model,  $\chi^2 = 81.197$  and  $df = 28$ . For the alternative, unidirectional model,  $\chi^2 = 119.593$  and  $df = 33$ . In testing the hypothesis that the original, bidirectional model may be replaced by the unidirectional model, the  $p$  value was found to be less than .001, indicating that the bidirectional model is a significantly better fit for the data.

### **Discussion**

The purpose of this study was to test bidirectional relationships among various impulsivity-related traits and alcohol use in young adulthood, examining impulsivity as both a predictor and consequence of alcohol use. Existing cross-sectional and longitudinal findings have demonstrated that impulsivity is a significant predictor of substance use and problems, and studies examining the contribution of substance use to later impulsivity have found it to be a significant predictor of later sensation seeking (Horvath et al., 2004; Quinn et al., 2011) and prototypical impulsivity (Quinn et al., 2011). Research indicates that impulsive personality traits vary in their relations with outcomes of interest, including different types of alcohol outcomes (e.g., amount/frequency of use vs. problems; Curcio & George, 2011), raising the possibility that different impulsive traits may be influenced by substance use to different degrees. The current study sought to address this question by examining bidirectional relations between the facets of impulsivity assessed by the UPPS-P and alcohol use across a 1-year period. Of particular interest were the bidirectional relations of alcohol use with urgency (defined as the tendency to act rashly while experiencing strong affect), which demonstrate robust relations with problematic substance use and other negative outcomes.

As hypothesized, we found significant bidirectional associations between impulsivity and alcohol use, with impulsive personality predicting later alcohol use, and alcohol use predicting later increases in impulsive personality. This finding is consistent with the Correspondence Principle, which posits that personality traits that predispose individuals to particular life experiences can in turn be reinforced by these experiences (Caspi et al., 2005), and supports the hypothesis that engaging in heavy substance use can influence personality development over time. Although this pattern was true of impulsive personality in general, it was not for each of the UPPS-P facets individually. Relations with alcohol use varied among the impulsive traits examined, supporting the utility of a multifaceted model of impulsivity. Consistent with prior research (i.e., Quinn et al., 2011), lack of premeditation and sensation seeking were significantly predicted by earlier

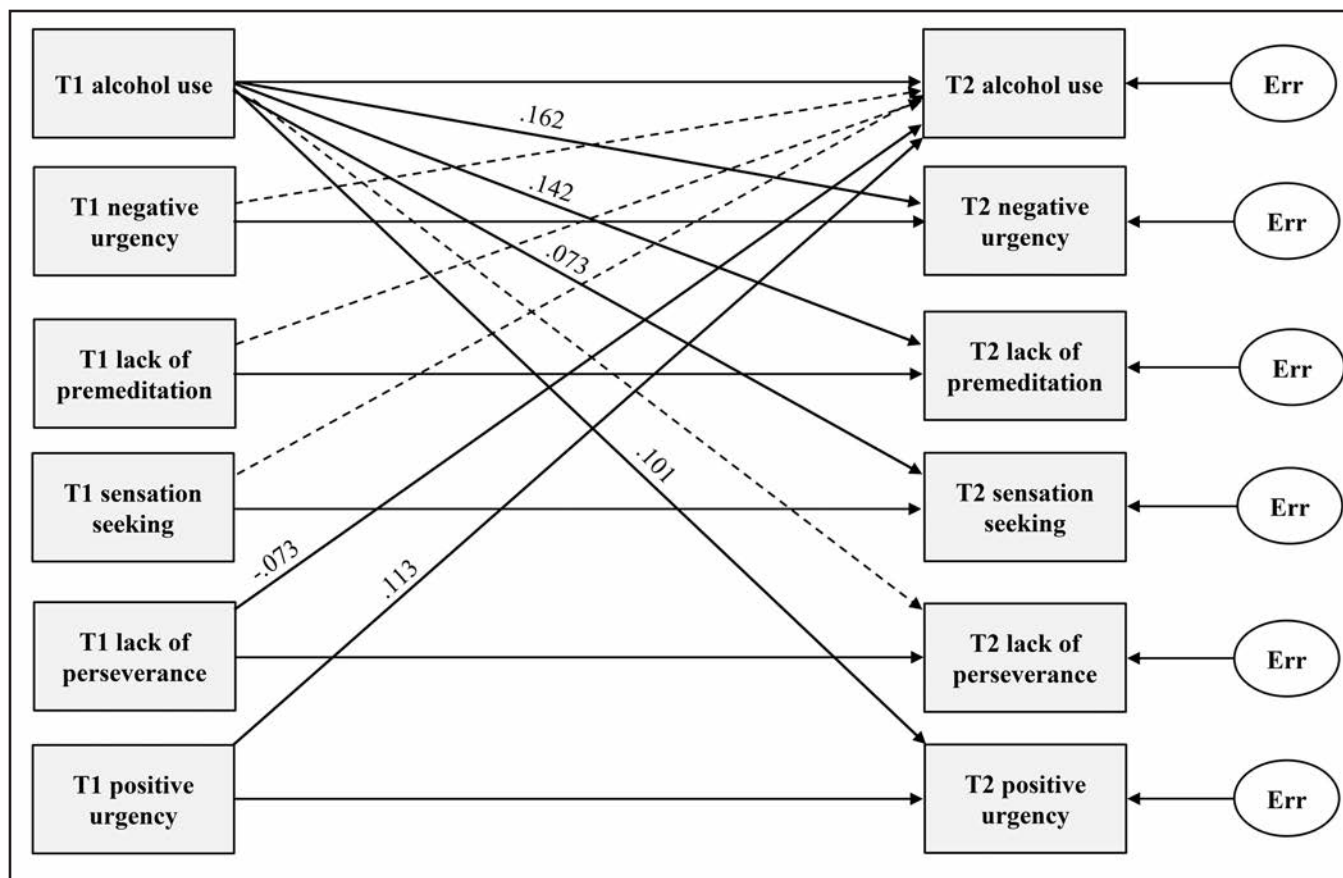


FIGURE 1. Final bidirectional model. T1 = Time 1; T2 = Time 2; err = error term. Covariances among T1 variables and T2 error terms are not shown. Significant relations are shown as solid lines, and nonsignificant relations are shown as dashed lines. Beta values are included for significant bidirectional relations but not for nonsignificant relations or stability coefficients.

alcohol use, as were positive urgency and negative urgency. Only positive urgency demonstrated a truly bidirectional relation with alcohol use because it was both a significant predictor of later use and significantly affected by earlier use.

The observed impact of drinking on impulsivity may be reflective of the effect of rash behavior occurring while intoxicated on an individual's subsequent ratings of his or her typical personality. This would be consistent with the findings of previous studies where, when administered alcohol, social drinkers tended to behave impulsively on subsequent laboratory tasks (Dougherty et al., 2000, 2008), and research indicating that heavy drinkers demonstrate an increase in impulsive behavior following a high dose of alcohol that light drinkers do not (Reed et al., 2012). Considering specifically the bidirectional relation of alcohol use and urgency, individuals high in the trait may find that, because of peer acceptance of heavy drinking, consuming alcohol is an acceptable way to act out while experiencing strong affect, and intoxication may in turn contribute to increases in intense emotion and impulsive behavior. Another possibility is that impulsive alcohol use while feeling strong affect serves to

decrease negative affect or increase positive affect, increasing the likelihood that an individual will engage in similar behavior when feeling strong affect in the future.

One unexpected result was that sensation seeking and lack of premeditation did not predict alcohol use 1 year later, which is in contrast to the findings of Quinn et al. (2011), where both sensation seeking and prototypical impulsivity were predictive of later heavy drinking. This discrepancy may be the result of a difference in the measure of impulsive personality because the prior study measured impulsive personality using the Zuckerman–Kuhlman Personality Questionnaire (Zuckerman et al., 1993), whereas the present study used the UPPS-P. The Zuckerman–Kuhlman Personality Questionnaire assesses traits similar to UPPS-P sensation seeking and lack of premeditation but does not include an assessment of urgency. It is possible that including urgency in the model would have attenuated the relations they discovered between the assessed impulsive traits and later alcohol use.

Although distinct, the impulsive personality traits assessed by the UPPS-P are highly related. Without explicitly measuring and controlling for urgency, the other impulsive

personality variables may have been “contaminated” by urgency, making them appear more highly related to drinking. Another possibility is that differences in the period in which impulsive personality was first assessed may have contributed to the differences in study findings: Quinn et al. (2011) assessed individuals in their senior year of high school, whereas the present study assessed individuals during the first or second semester of their first year of college. Perhaps sensation seeking and lack of premeditation more strongly influence alcohol use early in the transition to college life, in which case the individuals in our sample at risk for heavy alcohol use based on high levels of these impulsive traits would have already been drinking heavily at the time of the first assessment, making it less likely that we would observe a significant change in use over time.

Another unexpected result was that lack of perseverance predicted lower levels of alcohol use 1 year later. This appears to be a suppressor effect related to the high correlations among the impulsive personality traits assessed by the UPPS-P (Table 1) and our allowing the traits to correlate in the model. When the overlap between alcohol use and the other impulsive personality traits is taken into account, the residuals of alcohol use are negatively associated with some other factor not examined in the present study for which lack of perseverance becomes a proxy. Consistent with this interpretation, lack of perseverance itself was not significantly correlated with alcohol use at either time point. Another possible explanation is that the significant multivariate finding is due to a type I error.

### *Clinical implications*

The current study provides further support for positive urgency’s utility in predicting later alcohol use among young adults, which may have important clinical implications. Prevention interventions specifically targeted to individuals high in prototypical impulsivity and sensation have demonstrated promising results (Conrod et al., 2006, 2011), and the results of the present study suggest that a personality-targeted intervention for individuals high in positive urgency could also be useful. Developing a better understanding of the mechanisms by which urgency affects alcohol use could inform such interventions by providing specific targets for the behaviors and skills addressed. For example, if urgency represents the use of risky behavior as a way of increasing positive affect, useful interventions may focus on developing alternative responses to strong affect. If these individuals have difficulty engaging in certain cognitive processes (e.g., evaluating risk) while experiencing strong emotions, interventions that help clients to become more mindful of emotions and impulses (e.g., Mermelstein & Garske, 2015; Witkiewitz & Bowen, 2010) may be beneficial.

Similarly, the findings that alcohol use significantly affects later impulsive personality may also be relevant to

the treatment for problem alcohol use, although research to clarify the mechanisms that account for this relation is needed. Perhaps the observed increases in impulsive personality traits as a result of earlier alcohol use are a function of the impact of the development of substance use pathology on personality, which would be consistent with findings demonstrating that impulsiveness (Östlund et al., 2007) and behavioral disinhibition (Hicks et al., 2012) can be affected by the onset and course of substance use disorders. If so, this could be relevant information for treatment providers in relation to problems that might emerge for individuals being treated for substance use disorders, such as engagement in other types of impulsive behavior. Psychoeducation on the impact of substance use on personality may be a relevant addition to treatment. Another possibility is that heavy alcohol use leads to changes in personality through its impact on individuals’ social environment by making it more likely that they will form relationships with other impulsive individuals. These friendships in turn could provide reinforcement or increased opportunities for future impulsive behavior. If alcohol use’s effect on impulsive personality is accounted for by social factors, it could be useful for interventions to focus on modifying an individual’s social environment.

### *Limitations and future directions*

The present study had several limitations that could be addressed in future research. The sample lacked racial and ethnic diversity, and it would be worthwhile to examine relations in a more diverse sample. Next, because participants were reporting on behaviors that are illegal for their age group, even though they were reassured that there would not be any legal ramifications for reporting illegal substance use, it is possible that some participants may have underreported or otherwise distorted their substance use history. It is possible that the assessment of substance use in a one-on-one interview with an experimenter (vs. the administration of a questionnaire in a group setting or using a computer-based self-report) could affect the degree to which participants disclosed substance use honestly. Although a college student sample seemed well suited to the research questions of interest, participants were not randomly selected from the entire population of young adults and thus constitute a convenience sample. In addition, it will be essential to examine these relations in other samples because it is possible that differences in context (e.g., attending college vs. working full time) and age (e.g., young adulthood vs. adolescence) might affect these relations.

As discussed earlier, it is vital for future studies to clarify the mechanism(s) through which alcohol use influences personality over time, because understanding the factors accounting for this relation may inform substance use interventions. Although the use of a two-wave design allowed for examination of the bidirectional effects over time, future

studies should examine the observed relations over a longer period and/or use more frequent intervals of assessment. This would also allow for consideration of the duration of the observed effects, specifically whether they are long lasting or have temporary changes in personality. Recent findings suggest that the impact of earlier alcohol use on subsequent prototypical impulsivity and novelty seeking may be limited to short timeframes rather than being long lasting (Littlefield et al., 2012). Thus, it will be imperative to examine the longer term impact of substance use on urgency. Examining the relations identified in the current study over a longer time frame may also be useful in understanding the mechanisms through which alcohol use affects personality and vice versa.

### Acknowledgments

The authors thank the members of the U.K. Center for Drug Abuse Research Translation for their valuable feedback.

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